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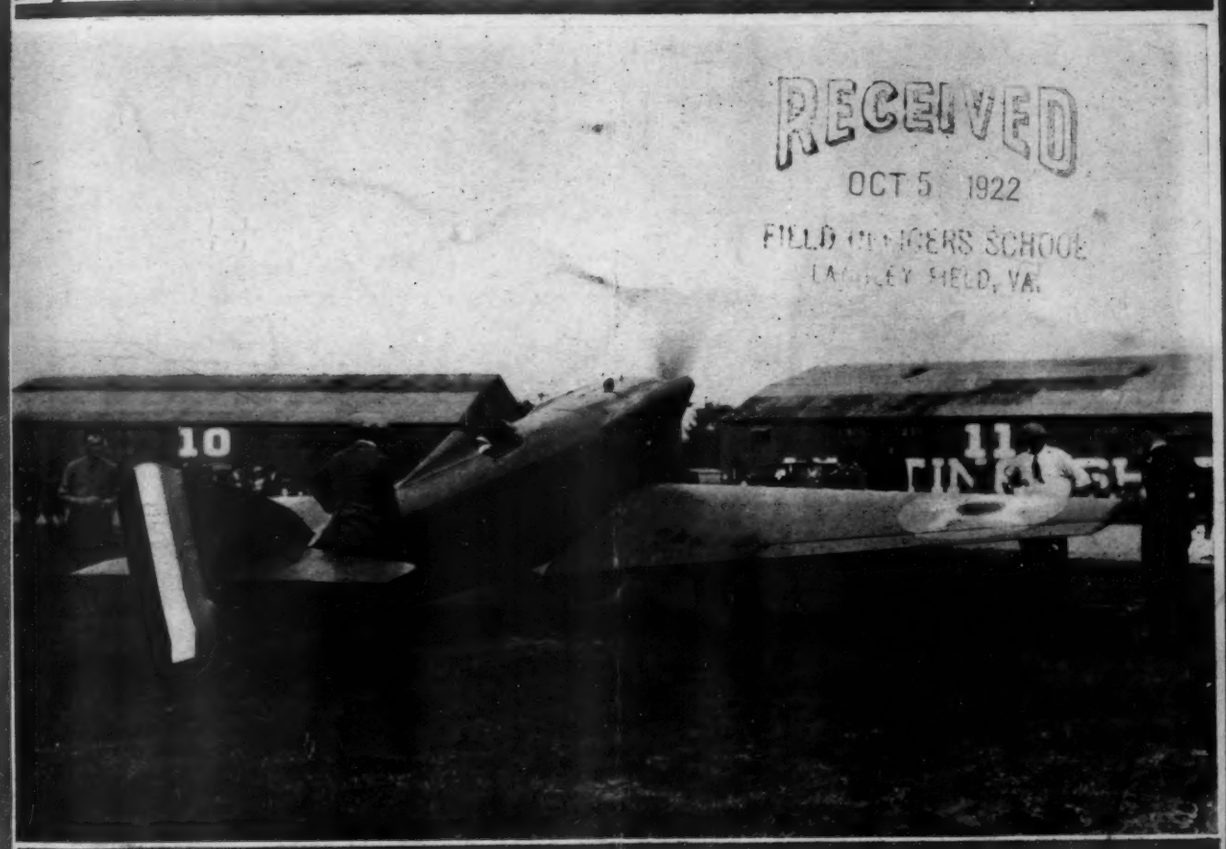

Wright-Sperry Racer (380 hp. Wright), an Army entry in the Pulitzer Race, warming up for a trial flight

VOLUME XIII

Number 14

SPECIAL FEATURES

THE PULITZER RACE ENTRIES DESCRIBED

THE ENTRIES IN THE CURTISS TROPHY RACE

RULES OF THE CURTISS MARINE FLYING TROPHY RACE

THE GARDNER, MOFFAT CO., INC.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office at Highland, N. Y. under Act of March 3, 1879.

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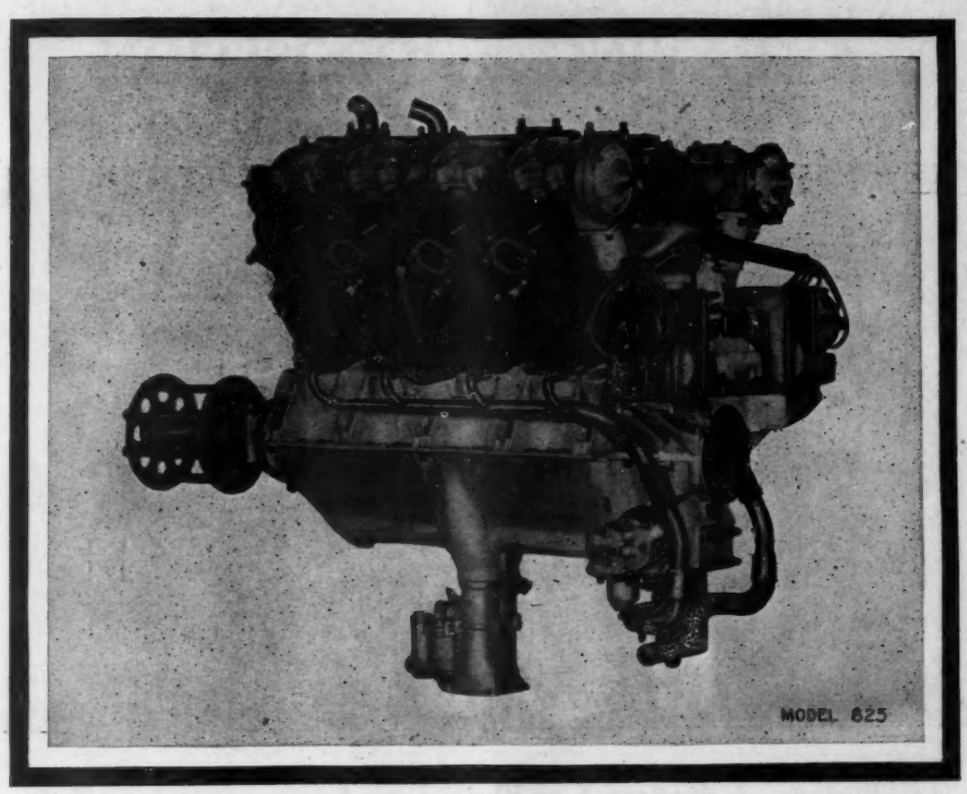

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High performance with low operating cost makes the ES-1 an exceptionally economical and practical machine for passenger or cargo carrying.

Pay Load	955.60	lbs.
High Speed, Full Load	90	m.p.h.
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Climb, Full Load, per minute	400	ft.
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Pay Load per h.p.	6	lbs.
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Twin 90 h.p. Le Rhone Engines are so installed that the ES-1 is easily controlled and maneuverable on one engine.

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Equipment and Furnishings Combine every modern means for convenience, comfort and ease of operation.

Manufactured by skilled mechanics who have had years experience in the perfection and production of the highest class airplanes.

Everyone now engaged in or planning to enter the field of commercial aviation should know more about the Elias-Stupar Biplane.

Send at once for Complete Description and Special Proposition

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AIRCRAFT DEPT.

BUFFALO, N. Y.

Contractors to U. S. Army and Navy

Members, Aeronautical Chamber of Commerce

OCTOBER 2, 1922

AVIATION

VOL. XIII. NO. 14

Member of the Audit Bureau of Circulations

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ITHACA, NEW YORK

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Vol. XIII OCTOBER 2, 1922 No. 14

The Detroit Aviation Meet

THE Detroit Aviation Meet, which opens on October 7 with the Detroit Aerial Water Derby, including the Curtiss Marine Flying Trophy, and which comes to a close on October 14 with the Pulitzer Trophy race, America's speed classic, promises to be not only the most important flying meet of this year, but also the biggest event of its kind ever staged in this country.

With its six distinct events, calling for practically all types of aircraft constructed, from flying boats and float planes to multi-engined large capacity machines, and from light commercial ships to the high speed racers, the Detroit meet will afford the public an unparalleled opportunity of seeing in flight the principal and most modern aircraft we possess.

Leaving aside the purely spectacular features of this meet, and in particular of the Pulitzer Trophy race, where it is likely that new world's speed records will be established, the Detroit gathering may be expected to give the aeronautical world some eminently practical results. The development of the powerfully engined racers will be of great benefit to the Air Services in that it will mark a new advance in pursuit ship design. A glance at the racers illustrated in this issue should bear out this statement. The prevalence of machines with cantilever or semi-cantilever wings seems to indicate that this type of construction has emerged from the experimental stage in which it was a year or so ago, when its very principle elicited much controversy.

What is very noticeable in all designs, is the careful manner in which all excrescences are streamlined and how the whole structure of the airplane is being increasingly encased in a single streamline body. The experiment of having aerofoil shaped radiators set into the wings is among all innovations probably the most original contribution of the forthcoming Pulitzer Race, and the behavior of these radiators will be worth close watching.

An Echo of the Gordon Bennett Race

ELSEWHERE in this issue there is printed a letter from H. E. Honeywell, the well known balloonist who was one of the American competitors in the last Gordon Bennett Balloon Race, held at Geneva, Switzerland. Our readers will remember that some time elapsed before the winner of this race was officially announced, a delay which was due to the Belgian entrant, Lieut. E. de Muyter, having his balloon carried away by the wind after alighting. The balloon was eventually found, however, and shipped back to Zurich together with the barograph and the log book, whereby the Belgian pilot's claim to having covered the greatest distance was substantiated.

With due respect to Captain Honeywell's opinion, we are inclined to doubt that he was deprived of the victory through what could not be considered else but foul play—were it true. We cannot believe that the entire contest committee of the Aero Club of Switzerland was composed of such poor sportsmen as to juggle with the regulations in order to award the victory to a European entrant just because an American victory would have meant the end of the Gordon Bennett balloon races. Nor is it apparent to us why the Swiss sportsmen who handled the event in such a splendid manner should have been particularly influenced in favor of the French and Belgian entrants. If J. Berry, an American, was disqualified in the 1912 race from Stuttgart, it should also be remembered that in the 1909 race—which by a curious coincidence also started from Zurich and was managed by the same Swiss Aero Club—it was the French entrant Alfred Leblanc who was disqualified for losing his balloon in the Carpathian mountains. Hence it would seem that the rule works both ways.

De Muyter "lost" his balloon only temporarily, and since it eventually turned up with the documentary evidence of his flight, it seems logical that he should have been awarded the cup.

It may be argued that the rules of the International Aeronautical Federation are not quite explicit on this point. Cases without precedent occur in races now and then and the setting of a precedent which becomes necessary often causes hard feeling. In the case of Captain Honeywell it is evidently too late to lodge a protest with the Aero Club of Switzerland—this should have been done, if it was not, right after the race.

Weight Estimate in Preliminary Design

WHEN the preliminary design of an airplane has been laid down, it is a difficult matter to make changes in the detail design. Still more difficult is it to make changes in process of construction.

It is a peculiar thing that most new airplane designs require a certain amount of modification, or fail to live up to the estimate of performance because of an error in the weight estimate. The weight, as a rule, seems to run higher than the preliminary figures would show. Tail heaviness follows in many instances, and always a decrease in performance.

In view of this well known fact, it is interesting to point out that the Bureau of Aeronautics, Navy Department, has developed a particularly efficient system of checking weights in process of design. While this checking system adds a good deal to the work of the drafting office, it has the great advantage of avoiding many disappointments at the trial flights.

We believe that almost as careful a weight estimate in the preliminary design would be well worth while applying in all cases. The experience of designers indicates that with careful stress analysis, dimensioned sketches of some of the main parts, and—last but not least—generally careful work, very accurate estimates of weight can be obtained in aircraft design.

• • •

The Detroit Seaplane and Airplane Races

A Compendium of Useful Information Concerning The Scheduled Events, the Ships and the Pilots

THE WHITE HOUSE
WASHINGTON

September 6, 1922.

My dear Mr. Coffin:

I have many times given expression to my interest in the development of aviation. I fully realize the influence which this newest and speediest means of transportation and travel is destined to exert upon civilization.

Aviation's vitally important part in the general scheme of our own national defense is already well recognized. A strong and healthy commercial aviation development is a prerequisite to all adequate plans involving our national security and welfare.

Therefore, it is with the greatest satisfaction that I extend to the Detroit Aviation Society and, through your committee, to the National Aeronautic Association my sincere appreciation of the objects you are seeking and my best wishes for the complete success both of the October contests and of the national convention to be held coincident therewith.

Sincerely yours,

Warren G. Harding

Mr. Howard E. Coffin,
Chairman, Committee on Organization,
National Aeronautic Association.

President Harding commended the Detroit airplane races and the second National Aero Congress in the above letter

The Detroit Aviation Meet, organized by the Detroit Aviation Society of 4612 Woodward Ave., Detroit, Mich., was primarily scheduled for the purpose of holding the third annual contest for the Pulitzer Trophy. However, in order to arouse the widest possible interest in flying and stimulate the development of commercial aviation in both land and sea going branches, the plans have been elaborated to include diversified types of planes.

Prizes in the various events will be awarded on the basis of the best combination of high performance and improved construction without, however, having recourse to too complicated rules incapable of being satisfactorily applied.

The Detroit Aviation Meet will be held from Oct. 7 to 14 inclusive, comprising the following events:

Event No. 1. Detroit Aerial Water Derby, including competition for the Curtiss Marine Flying Trophy, on Saturday, Oct. 7, with a total of $2,000 of cash prizes;

Event No. 2. Detroit News Aerial Mail Trophy, a race for large capacity muti-engined airplanes, with a total of $2,000 of cash prizes, Thursday, Oct. 12;

Event No. 3. Aviation Country Club of Detroit Trophy, a race for light commercial airplanes, with a total of $2,000 cash prizes, Thursday, Oct. 12;

Event No. 4. Liberty Engine Builders Trophy, a race for observation type two-seater airplanes, with $2,000 of cash prizes, Friday, Oct. 13;

Event No. 5. Pulitzer Trophy Race, a free-for-all race for high speed airplanes, with $2,000 of cash prizes, Saturday, Oct. 14.

In each of the above the cash prizes are apportioned as follows: First Prize $1,200; Second Prize $600; Third Prize $200.

Event No. 6. On-to-Detroit Race, a free-for-all race for airplanes flying to Detroit from a point 200 or more miles distant, with $850 of cash prizes and silver loving cup. To be competed Oct. 12-14.

The entry fee, $100.00 will be refunded if the contestant is in his allotted place ready to start in the contest, provided the entry was received before Aug. 1, 1922. Entries received after this date, but prior to Aug. 8, are penalized $25.00, and entries received after the latter date, but prior to Aug. 15, are penalized $50.00.

Rules of the Curtiss Marine Flying Trophy Race

EVENT NO. 1, SATURDAY, OCT. 7

Detroit Aerial Water Derby, including Curtiss Marine Flying Trophy

Cash Prizes

First Prize	$1,200.00
Second Prize	600.00
Third Prize	200.00
Total	$2,000.00

Free-for-All Race for Flying Boats and Seaplanes

Provisions of New (1922) Deed of Gift for Curtiss Marine Trophy

1. The trophy shall be perpetual and competed for annually by seaplanes and flying boats.

2. The contest shall be in the nature of a race either around a closed circuit or from point to point. The rules governing the race each year to be drawn up by the Contest Committee of the Aero Club of America.

3. The trophy shall be awarded each year to the Aero Club represented by the pilot of the winning machine, and this Club shall be entitled to the possession of the trophy until one month prior to the next succeeding contest, at which time the trophy shall be returned to the Aero Club of America. The Contest Committee of the Aero Club of America, with the consent of the Board of Governors, has the privilege of conducting each annual contest for the Curtiss Marine Trophy, or of assigning this privilege, under sanction, to any other Club or organization.

1. *Conditions of Contest*

(*a*) Factor of safety—Monoplanes—6 as loaded for start of race. Biplanes—4 as loaded for start of race.

(*b*) Air speed greater than 70 m.p.h., as loaded for start of race.

(*c*) Visibility and maneuverability (water and air) which in opinion of Contest Committee, Detroit Aviation Society, is not a menace to the other contestants or spectators.

2. *Distance*

Approximately 160 miles—eight times around a closed course of 20 miles.

3. (*a*) *Start*

The starting signal will be given at 3 p. m. Planes to be in their allotted places at 2 p. m. Pilots' meeting for the final instructions to be announced later.

(*b*) *Position at Start*

Planes competing for class and invitation prizes in addition to Curtiss Marine Trophy will be sent away together in a class, the faster classes starting before slower. Competitors for Curtiss Marine Trophy only will be sent away together after the classes.

(*c*) *Method of Start*

Contestants will be lined up along the shore in shallow water for the start. The Starter will assign an assistant starter to each plane who shall raise the signal flags for its pilot, as follows: The starting signal (for motors only), a red flag, will be raised by the Chief Starter at 2:45 p. m. When the motor on each plane is running, the assistant starter assigned to that plane will raise the red starting flag. When all assistants have raised the red starting flags, but not later than 3:00 p. m., the Starter will raise, in addition to the red starting flag, the white warning flag, which signifies that the getaway signal will be given in ten seconds; each second will be counted by lowering the red flag, the getaway signal being the lowering of both red and white flags, at which time seaplane No. 1 will taxi up to the starting line and fully throttle its motor to the satisfaction of the starter who shall then raise a red flag which is a signal to the seaplane to proceed across the starting line at no greater speed. When the seaplane crosses the starting line between pylons B and E, the starter shall give the getaway signal by raising a white flag. However, should the starter not be satisfied with the speed of the seaplane when it crosses the starting line, he shall raise a blue flag which signifies an irregular start and the seaplane will be required to return and try another start. As soon as the first plane has passed the starting line successfully, seaplane No. 2 which has in the meantime proceeded slowly from its standing position in shallow water will be signaled up to the starting line and sent away in the same order as seaplane No. 1. Seaplane No. 3 then proceeds seaplane No. 2 in the regular order, etc., etc. In event of a plane making an irregular start as outlined above, the contestant shall make a right-hand turn around pylon E, keeping well away from other seaplanes which are taxiing to the starting line. The seaplane so delayed in its start shall not attempt a second start until all other seaplanes have been sent away and shall remain sufficiently well in shore to be completely out of the way of other contestants starting. If any contestant has difficulty in starting his motor, his assistant starter will not raise the red starting flag, but, when the Chief Starter raises the white warning flag, will raise a blue flag, which is a request for a deferred start. Deferred starts shall be granted without penalty, except that no plane will be started after a delay of two hours.

Any plane having once started cannot receive another start; however, it may complete the race, though forced down, provided it can do so before 5:30 p. m.

4. *The Finish*

The finishing time will be taken when each plane flies across the finishing line between the marks defining this line, after having completed the full course, 160 miles.

5. *The Winner*

Of each first place shall be the pilot who has completed the full course in the shortest elapsed time, and of each second place the second best time, etc., provided the pilot is not disqualified. The Curtiss Marine Trophy will be awarded to the Club represented by the winning pilot and the prize money paid to the entrant of the winning seaplane or flying boat. Agreements between pilots and entrants as to their proportional share of the prize money will be upheld by the Contest Committee, who will pay the prize money in accordance with agreements in writing between pilots and entrants, presented to the Contest Committee prior to the race or within 24 hours after the finish of the race.

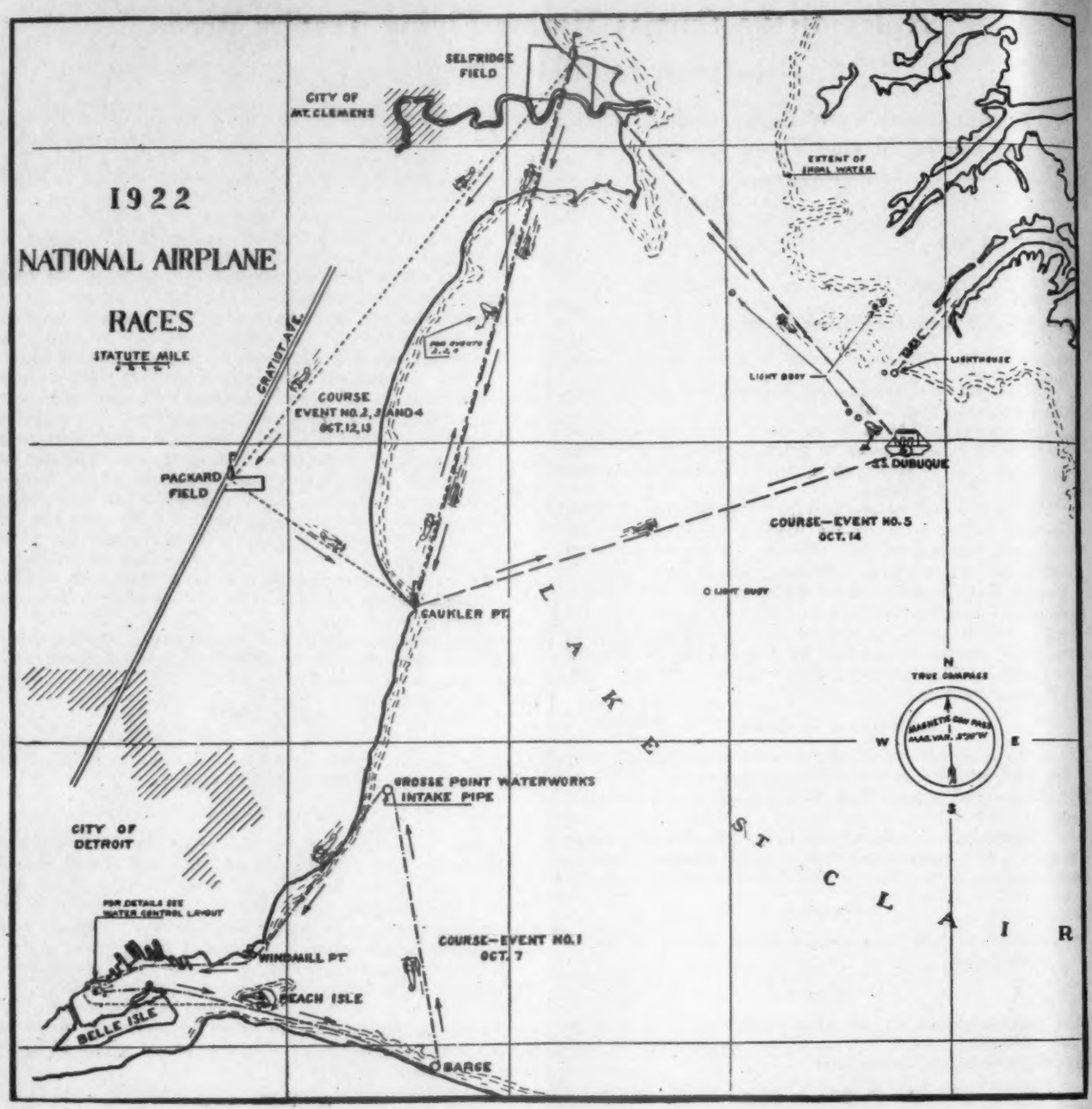
6. *Qualifications*

No seaplane or flying boat may take part in the contest unless it is piloted or commanded by a pilot, who must be on board and who must be furnished with a license issued by the Contest Committee of the Aero Club of America. (F.A.I. Rules, Art. 67). Every person furnished with Pilot's certificate of F.A.I. may obtain license issued optionally by Contest Committee, Aero Club of America. (F.A.I. Rules, Art. 70). A license will be valid until the 31st December of the current year. The Contest Committee, Aero Club of America, may, upon the occasion of any competition or test, issue temporary license as pilot for this one test only to any person whose qualifications it considers sufficient. (F.A.I. Rules, Art. A-28). See also note under "Entries" on page 3. Withdrawal of license for incompetence of pilot. (F.A.I. Rules, Art. 123).

7. *Disqualifications*

Any contestant breaking the rules of the race, or subsequent ones which may be sent out in writing, shall, upon recommendation of the judges, be disqualified.

Every person organizing or taking part in a sporting event of whatsoever nature is supposed: (1) "To know the present regulations (F.A.I. Rules) thoroughly." (2) "To agree to



Map showing the courses to be flown by the pilots participating in the flying events of the Detroit Aviation Meet, Oct 7 and Oct. 12—14

submit without restriction to the consequences that result therefrom." (F.A.I. Rules, Art. 7).

8. *Rules of the Race*

(*a*) Upon receiving the getaway signal for the start, pilots shall hold a straight course and not cross or attempt to cross in front of the planes on either side.

(*b*) From a standing start contestants will fly around the first four laps of the course, and during laps 5, 6 and 7 will be obliged to alight on the water and while running along the surface of the water enter into and pass through, in the proper direction, the water controls which shall be designated by moored markers on both sides. Note: (There will be only one water control in the shape of a hair-pin turn). The entrance into and exit from this control will be located sufficiently near the turning mark that anything but normal landing speeds or normal taxiing speeds will overrun the turning mark and result in loss of time.

(*c*) While within the markers bounding the water controls, the contestants must maintain constant contact between the water and fixed surfaces of the principal flotation gear (wing or tail pontoons, or water rudder, or any other adjustable, movable or flexible attachment is not sufficient contact with the water, under this rule).

(*d*) A plane overtaken, both planes being in the air, must hold its altitude and a true course, in order that it may not in any way impede or interfere with the faster overtaking plane.

(*e*) A plane overtaking a slower plane, both planes being in the air, shall never pass or attempt to pass between that plane and any pylon or object used to mark a turning point.

(*f*) Within the water controls, both planes being on the water, the overtaking plane must pass to the right and all mechanicians of competing planes must look to the rear and warn pilots of an overtaking plane. Pilots of overtaken planes must keep to the left and give the faster, overtaking plane room to pass on the right.

(*g*) The finishing line must be crossed in flight—not on the water—and, after crossing the finishing line, all planes shall continue on their course until they have attained sufficient

(*j*) No contestant shall be permitted to "dope" the fuel with picric acid, ether, or similar highly explosive liquids. Anti-knock fuels may be used.

9. Protests

No protest shall be considered unless presented in writing to the Contest Committee of Detroit Aviation Society within twenty-four hours after the finish of the race. (F.A.I. Rules, 78, 79, 80). (Appeals. See F.A.I. Rules, Art. 178-179).

10. Numbers

Each plane shall have a number assigned to it by the Contest Committee, painted on the bottom surface of lower wing and on each side of the fuselage, clear of the wing, in characters as large as possible. It shall have no other numbering over twelve inches in height.

11. Advertisements

"Competitors are forbidden to display on their apparatus or material any commercial advertisement except the trademark of the constructor of the apparatus." (F.A.I. Rules, Art. 89).

12. Number of Contestants

Minimum number of contestants SIX.
Maximum number of contestants FIFTY.

Additional Prizes

The (to be announced later) prizes for greater air speed will be awarded to the contestant who, during the Curtiss Marine Trophy race, completes laps 2, 3 and 4 in the shortest total elapsed time. (The first lap is not included because of the standing start).

Additional prizes will be awarded for Class or Invitation races to be announced by the Contest Committee of the Detroit Aviation Society after entries have closed.

Exceptions

Stream-lining which does not alter the structure of the part or parts stream-lined.

Motors eligible for class races are determined by the above rule and these exceptions.

1. Stream-lining which does not alter the structure of the part or parts stream-lined.
2. Motors may be equipped with any make or design of propeller, ignition, spark plugs, carburetor, including intake manifold, exhaust manifold, gasoline and oil systems.

Invitation Races

The Contest Committee of the Detroit Aviation Society may invite any of the entrants to compete for a special prize.

NOTE: The word *plane* as used in these rules means flying boats or seaplanes.

Characteristics of the Aircraft Entered in the Curtiss Marine Flying Trophy Race

Saturday, Oct. 7, 1922

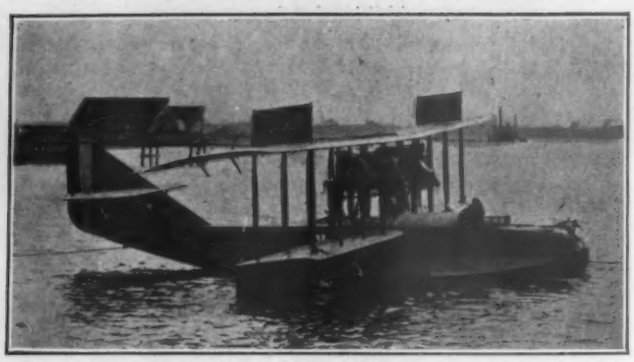
The opening event of the Detroit Aviation Meet is the race for the Curtiss Marine Flying Trophy donated by Glenn H. Curtiss. This contest is open to seaplanes of the float and boat types only, and is annually competed for under rules drawn up with special view to the progress achieved in seaplane construction.

In this year's race the U. S. Navy has entered eleven seaplanes, the characteristics of which are as follows:

Vought VE7H

Type VE7H is the standard Vought two-seater advanced training plane now used by the Navy as an observation plane and fitted with a pontoon. This airplane was designed and built by Chance Vought in 1918 and is supplied as standard equipment to the Atlantic and Pacific Fleet Air Squadrons as a single-seater land plane for combat training, as a two-seater land plane for general observation duty, and as a two-seater seaplane as an observation plane to be carried aboard ship. Vought planes of this type are now on board the Maryland and have been successfully launched from the Maryland's catapult. The Wright E3, 8 cyl. engine is a modification of the standard 180 hp. E2 engine made by the same firm, the modification consisting essentially in high compression pistons, high lift cams and other alterations which permit the engine

Curtiss 18T (400 hp. Curtiss CD12), Navy entry No. 4 in the Curtiss Trophy race. Pilot: Lt. T. B. Lee, U.S.N., or Lt. L. H. Sanderson, U.S.M.C.



Curtiss H16 (2-350 hp. Liberty's), Navy entry No. 2 in the Curtiss Trophy race. Pilot: Lt. R. Irvine, U.S.N.

to develop between 220 and 240 hp. at 2000 r.p.m. revolutions. The high compression E3 engine is designed for blended fuel.

CHARACTERISTICS

Type, tractor float biplane
Span, upper and lower—34 ft. 1⅜ in.
Length, 30 ft. 1 in.
Height, 10 ft. 2 in.
Chord, 4 ft. 7½ in.
Gap, 4 ft. 8 in.
Angle of incidence, upper 1 deg. 45 min.; lower 2 deg. 15 min.
Dihedral, 1 deg. 15 min.
Wing area, 284.5 sq. ft.
Aerofoil sec. R.A.F.—15
Gross weight, 2175 lb.
Maximum speed, 120 m.p.h.
Engine, Wright E3, 220 hp.
Pilot: Lt. H. A. Elliot, U. S. N.

Curtiss HA

The HA is a Curtiss designed and built seaplane brought out in 1918 as an answer to high performance German seaplanes which were interfering with the bombing operations conducted against the German submarine bases on the Belgian coast. The problem was to develop a fast two-seater seaplane using a single Liberty Engine. Due to change in conditions the HA type was never put into production, and the sample plane tested in 1918 has been reconditioned and entered in the Curtiss Marine Trophy Race, but fitted with a special high compression Liberty engine. This is a standard Liberty engine with high compression pistons and new valves and should develop over 420 hp. on blended fuel. The machine was designed by W. L. Gilmor of the Curtiss Aeroplane & Motor Corp. in cooperation with Maj. B. L. Smith, U. S. Marine Corps.

CHARACTERISTICS

Type, tractor float biplane
Span, upper and lower, 42 ft. 0 in.
Length, 30 ft. 9 in.
Height, 11 ft. 5 in.
Chord, 6 ft. 2 in.
Gap, 6 ft.
Angle of incidence, 0
Dihedral, 0
Wing area, 490 sq. ft.
Aerofoil section, Sloane
Gross weight, 3906 lb.
Maximum speed, 135 m.p.h.
Engine, Liberty special HC, 420 hp.
Pilot: Ens. A. J. Williams, U. S. N.

Curtiss H16

The H16 is a standard twin Liberty engined flying boat used during the War both by the American and British Navies for submarine patrol and convoy duty. The plane was designed by G. H. Curtiss and built by the Curtiss Aeroplane & Motor Corp. in 1916. The Navy Department has a large number of these planes on hand and the one entered in the race is standard in all respects except that the Liberty engines have been provided with special high compression pistons. The H16 will be flown from the Naval Aircraft Factory to Detroit for the race, following the Hudson River, the Lakes of New York State to the Great Lakes.

CHARACTERISTICS

Type, twin-tractor flying boat.
Span, upper 95 ft. 1 in., lower 68 ft. 11 in.
Length, 46 ft. 2 in.
Height, 17 ft. 9 in.
Chord, 7 ft. 1 in.
Gap, 8 ft. 1 in.
Angle of incidence, 4 deg.
Dihedral, 1 deg.
Wing area, 1164 sq. ft.
Aerofoil section, RAF-6
Gross weight, 10,900 lb.
Maximum speed, 100 m.p.h.
Engine, 2 Liberty Special HC, 420 hp. each.
Pilot: Lt. R. Irvine, U. S. N.

Gallaudet D4

The D4 is a tractor biplane designed by Edson Gallaudet and built by the Gallaudet Aircraft Corp. in 1918. It was built for the Navy as a high speed two-seater seaplane making use of the Gallaudet gear drive. It is believed to be the only gear driven plane in the country and is of considerable technical interest for this reason. It is fitted with a single Liberty engine mounted in the fuselage, which drives by means of a ring gear a propeller which is situated immediately behind the wings. The fuselage or tail structure of the airplane extends through the center of the ring gear carrying the propeller.

CHARACTERISTICS

Type, float biplane.
Span, upper 46 ft. 5 in., lower 45 ft.
Length, 33 ft. 6 in.
Height, 11 ft. 8 in.
Chord, 7 ft.
Gap, 7 ft.
Angle of incidence, 2 deg. 10 min.
Dihedral, 0
Wing area, 620 sq. ft.
Aerofoil section, RAF-15
Gross weight, 5440 lb.
Maximum speed, 135 m.p.h.
Landing speed, 55 m.p.h.
Trial report, No. 5, dated Feb. 1919.
Engine, Liberty Special HC, 420 hp.
Pilot: Lt. W. K. Patterson, U. S. N.

Vought UO1

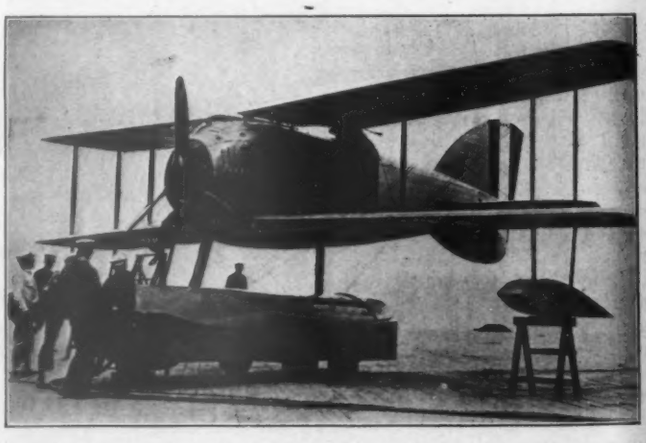
The UO1 is a new type of Vought observation seaplane, being developed by the Chance Vought Corp. for the Navy Department as a replacement for the standard VE7 Vought now used on ships for catapult launching. The plane is equipped with the new Aeromarine 250 hp. engine which presents a new feature in aeronautical engines in that it has removable cylinder heads.

CHARACTERISTICS

Type, tractor float biplane.
Span, upper 34 ft. 1⅜ in., lower 34 ft 1⅜ in.
Length, 29 ft. 3 in.
Height, 10 ft.
Chord, 6 ft.
Gap, 4 ft. 8 in.
Angle of incidence, 0
Dihedral, 0
Wing area, 308 sq. ft.
Aerofoil section, Albatros.
Gross weight, 2608 lb.
Maximum speed, 130 m.p.h.
Engine, Aeromarine U873, 250 hp.
Pilot: Lt. Comdr. M. A. Mitscher, U. S. N.

Curtiss 18T

Model 18T tractor triplane was designed by C. B. Kirkham and built in 1918 by the Curtiss Aeroplane and Motor Corp. as a two-seater combat plane of maximum performance. Had



Curtiss HA2 (400 hp. Curtiss D12) Navy entry No. 10 in the Curtiss Trophy Race. Pilot: Ens. A. J. Williams, U.S.N.

the War continued it is likely that this type would have been put into production for use on the Western Front. As it was, the sample plane made on trials a high speed of 162 m.p.h. which was then a world's record for any type of airplane and is still believed a world's record for a two-seater fighting machine.

For the purpose of the Curtiss Marine Trophy Race two of these airplanes which were in store have been reconditioned and fitted with pontoons to convert them to seaplanes. They are fitted with the Curtiss CD12, 400 hp., a light 12-cyl. engine

Navy Curtiss TS (200 hp. Lawrance J1), Navy entry No. 6 in the Curtiss Trophy Race. Pilot: Lt. S. W. Callaway, U. S.N.

especially designed for this airplane. These triplanes are believed to be the only triplanes in the country and are of considerable technical interest on this account.

CHARACTERISTICS

Type, tractor float triplane.
Span, upper, lower and middle, 40 ft. 7½ in.
Length, 28 ft. 3⅞ in.
Height, 12 ft.
Chord, 3 ft. 6 in.
Gap, upper 3 ft. 6 in., lower 2 ft. 11 in.
Angle of incidence, 2½ deg.
Dihedral, 0
Wing area, 400 sq. ft.
Aerofoil section, Sloane.
Gross weight, 3972 lb.
Maximum speed, 140 m.p.h.
Engine, Curtiss CD12, 400 hp.
Pilots: Lt. (j.g.) T. B. Lee, U. S. N. and Lieut. L. H. Sanderson, U. S. M. C.

Navy TS and TR Types

Types TS1 and 2, and TR1 and 3 are variations of the Navy shipboard combat plane type TS designed under Comdr. J. C. Hunsaker by the Design Section of the Bureau of Aeronautics and built at the Naval Aircraft Factory. The TS planes were designed to give the smallest and most compact plane with the maximum facilities for take-down and erection aboard ship. All wires and turnbuckles in the wing bracing are eliminated to facilitate rapid erection. The fuel tank is carried in the lower wing and is made detachable so that in case of fire, due to an incendiary bullet, the pilot can pull a release which will drop the tank and its inflammable contents clear of the machine. Another unique feature is the provision of interchangeable landing gears so that the TS planes may be used with land wheels as an ordinary land plane, or with twin pontoons as a seaplane depending upon the service required.

The TS1 is equipped with a new Lawrance air-cooled radial engine rated at 220 hp. This is the last word in air-cooled engine development and the race is considered an excellent place to give this engine a severe tryout. The engine has been developed for the Navy especially for the problem of shipboard airplanes where minimum weight and the greatest simplicity are pre-requisites. The TS2 is the same plane equipped with the Aeromarine 240 hp. engine.

The TR1 is the same TS plane provided with a Lawrance air-cooled engine, but given special racing wings, and the TR3 is the same as the TR1 except that the Wright E2, 220 hp. engine has been substituted.

These four planes constitute then a full-scale experiment of the greatest technical interest to the Navy, using three different engines and two different designs of wing. The occasion of the Curtiss Marine Trophy Race has been used to try out these design modifications under competitive conditions. The planes include a maximum of new and advanced features both in engineering and aerodynamics, and it is believed that the race between these four planes is secondary in interest only to the race for the Curtiss Marine Trophy for which they will compete.

CHARACTERISTICS

Type, tractor float biplane.
Span, upper and lower, 25 ft. 0 in.
Length, 24 ft. 7 in.
Height, 9 ft. 6¾ in.
Chord, 4 ft. 9 in.
Gap, 5 ft. 6 in.
Angle of incidence, 0
Dihedral, 3 deg. (lower wing only)
Wing area, 225 sq. ft.
Aerofoil section, USA27
Gross weight, TS1 : 2,025 lb. : TS2 : 2,085 lb.
Maximum speed, TS1 : 125 m.p.h.; TS2 : 130 m.p.h.
Engine, TS1 : Lawrance J1, 220 hp.; TS2 : Aeromarine U8D, 240 hp.
Pilots: TS1—Lt. (j.g.) S. W. Callaway, U.S.N.; TS2—Lt. H. J. Brow, U.S.N.

CHARACTERISTICS

Type, tractor float biplane.
Span, upper and lower, 25 ft. 0 in.
Length, 24 ft. 7 in.
Height, 9 ft. 6¾ in.
Chord, 4 ft. 9 in.
Gap, 5 ft. 6 in.
Angle of incidence, 0
Dihedral, 3 deg. (lower wing only)
Wing area, 225 sq. ft.
Aerofoil section, Mod. RAF15.
Gross weight, TR1 : 1,790 lb.; TR3 : 1,980 lb.
Maximum speed, 130 m.p.h.
Engine, TR1 : Lawrance J1, 220 hp.; TR3 : Wright E3, 220 hp.
Pilots: TR1—Lt. A. W. Gorton, U.S.N.; TR3—Lt. D. Rittenhouse, U.S.N.

EDITORIAL NOTE

Owing to the restrictions of space, the characteristics of the aircraft entered in the races, and the relative rules, for the Detroit News Aerial Mail Trophy, the Aviation Country Club of Detroit Trophy (Oct. 12), and the Liberty Engine Builders' Trophy (Oct. 13) will be published in the Oct. 9 issue of AVIATION.

Characteristics of the Aircraft Entered in the Pulitzer Trophy Race

Saturday, Oct. 14, 1922

The Pulitzer Trophy race this year has received a very large number of entries by the Army Air Service and Naval Aviation—twenty-one altogether. With the exception of the six Thomas-Morse MB3 and the VCP-R pursuit ships entered by the Army and the Curtiss Triplane entered by the Navy, every entry is a new type, specially built for this race, or a development of a previous type.

The new Army types comprise two Curtiss Racers, two Loening Racers, two Thomas Morse Racers, and three Verville-Sperry Racers. In addition the Army entered in the Pulitzer Race one VCP-R—the type on which Capt. C. C. Moseley won the first Pulitzer Trophy race, in 1920, and six Thomas-Morse MB3's pursuit ships.

The Navy entries include an improved model of the Navy Curtiss racer on which Bert Acosta won the 1921 Pulitzer Race; the Curtiss Triplane racer, which finished second in last year's race; a "mystery ship" known as the "Navy X" type; a Bee-Line (Booth-Thurston) racer specially designed for this signed for this race; and a Thomas-Morse MB7 racer.

Following are the characteristics of the new ships entered race; and a Thomas-Morse MB7 racer.

The Navy-Curtiss Racers

The Curtiss company has built for the Navy two biplanes of this type, the only difference between the two being that one carries the Lamblin type of radiator in the landing gear while the other is equipped with the wing type radiator, especially developed by Curtiss engineers, and described in the Army entry. The characteristics of the Navy-Curtiss biplanes embrace structural features which are significant of the development of the art. The plane, although primarily developed as a fighting unit of the Navy has an extraordinarily high factor of safety.

Its wings are noted for their multi-spar construction, and have a Curtiss ply covering instead of the conventional cloth. The value of such ply-wood construction is that it maintains the proper wing curve, and has far more strength than fabric.

The airplane built for the Navy has a general clearness of design that makes it stand out. It is streamlined from the nose of the propeller to the tail. Fuselage, struts, etc., all are streamlined, this being the practical adaptation of tests carried out for the last year in the Curtiss wind tunnel at Garden City. There is a marked improvement in radiation, and in motor cowling. The CD12 engine, a twelve-cylinder type, developing 400 hp. at 2000 r.p.m. lends itself particularly well toward streamlining.

The maximum speed of the Navy racer, as originally flown last year was in excess of 186 m.p.h., and low speed 70 m.p.h. Improvements in design and construction this year lead the builders to believe that a greater high speed and possibly a lower landing speed can be obtained. Even so, there is a very wide range of speed which makes the ship valuable for purely military purposes, in the scheme of marine defense as developed by the United States Navy.

A simplified oiling system reduces the number of tanks and parts to a minimum. The ships have an improved type of oil cooler, which maintains a constant oil temperature, and which is low enough to permit the motor to deliver its maximum horsepower when it is operated under full throttle, and stressed to the extreme degree. Inasmuch as in prior races in this country and abroad, much of the motor failure was due to overheating of oil and improper radiation, the Curtiss engineers believe that this feature will be of distinct advantage to the entries which they have constructed for the Army and the Navy.

In the construction of these biplanes, the fullest possible use has been made of aluminum and duralumin. This has the combined result of adding strength to the various members and also reducing weight. Piping, tanks, fittings, etc., are of this material in many instances.

Following are the general characteristics of the Navy-Curtiss Racer: Horsepower = 400 at 2000 r.p.m. Curtiss CD12 motor.

CHARACTERISTICS

Span (overall), 22 ft. 8 in.
Length, 21 ft. 0-⅛ in.
Height, 8 ft. 11 in.
Chord (all wing), 48 in.
Angle of incidence, 0 deg.
Gap, 48 in.
Stagger, 15 in.
Dihedral (lower only), 2 deg.

Navy-Curtiss Racer (400 hp. Curtiss CD12) entered by the Navy in the Pulitzer Trophy race. This ship has wing radiators, while its sister has Lamblin radiators. Pilot not yet designated

One of the two Army-Curtiss Racers (375 hp. Curtiss D12) entered by the Air Service in the Pulitzer Trophy race. Pilots: Lt. R. L. Maugham and Lt. L. J. Maitland

Wing Area
Upper wing panel, 88.0 sq. ft.
Lower wing panels without ailerons, 80.0
Total wing area, 168.0 sq. ft.
Control Surface Areas
Ailerons, 18.0 sq. ft.
Horizontal stabilizer (2), 12.60 sq. ft.
Elevator (2), 9.20
Tail Pin (1), 4.80
Skid Fin, .00
Rudder (1), 4.80
Power loading, 5.24 lb./hp.
Wing loading, 12.5 lb./sq. ft.
Wing section, Sloane
Performance
High speed (est.), 190 m.p.h.
Low speed, 70 m.p.h.
Weights
Light, 1735 lb.
Useful load, 430 lb.
Gross, 2165 lb.
Radiators built into wings, 10 m.p.h. faster.

The Army-Curtiss Racers

The two biplanes which the Curtiss Company designed and constructed for the Air Service represent a progressive development from 1920 when the first "Wildcat" was built.

Before arriving at the ultimate design, extensive investigations were made to determine the most efficient performances possible in a machine of this class. Guided by wind-tunnel tests as well as actual flight tests of previously built racing planes, choice was made of a biplane, the air resistance of which was to be reduced to a greater extent than ever before attempted.

The body structure is formed with "Curtiss-ply," a strong, light 2-ply veneer of laminated spruce 3/32 in. thick. The lines of the fuselage were designed around the smallest possible cross-sectional areas, merely large enough to fair in the engine and to accommodate the pilot. The projected area of the body is 25 per cent less than that of the Curtiss Navy Racer which won last year's Pulitzer Trophy Race.

The weight of the body complete is only 127 lb. due to the employment of duralumin fittings, together with the use of the Curtiss-ply construction which proved so successful in previous use.

Light weight, rigidity and contour stiffness are features of the multi-spar Curtiss-ply covered wings. The Curtiss 27 wing section is one developed by engineers from data obtained from testing high speed curves in the elaborate wind-tunnel maintained at Garden City.

The wing radiators, designed and perfected by the Curtiss Company deserve special mention. Many tests were made with these corrugated sheet brass radiator surfaces which replace the surfaces of the wings. With this system, advantage is taken of the flow of air around the wings, which cools the engine water without any extra head resistance whatever. They were considered for use on the Curtiss Pulitzer racers of two years ago, but as they were still in the experimental stage, it was decided to defer their use until complete data was available on their characteristics. Since that time they have been tried out continually, the first important demonstration being their fine performances on an "Oriole" at the Omaha Meet last spring. The most severe test was a cross-country flight by pilot "Casey" Jones, of nearly 1500 miles from New York to Kansas City, at a speed averaging 100 m.p.h. Having extensive patent claims on this type of radiator, the Curtiss Company believes its development and use will bring about an important advance in aeronautical progress.

The fixed surfaces, fin and stabilizer are of the Curtiss-ply cantilever construction, with no external bracing. Control surfaces, ailerons, elevators and rudder, are of steel and duralumin, linen covered; they weigh 7/10 ths lb. per square foot of area. All controls are actuated by means of internal cables and operating tubes.

The single-strut type of chassis used has the strength and rigidity of the conventional "V" chassis, yet the resistance has been reduced two-thirds. Even the wheels and hub caps have been streamlined. Wheels are provided with cupped discs of aluminum which cover the spokes and hub; linen covering is applied over the wheel and tire in such a manner that a smooth oval section is presented to the air stream.

The tail skid is made of laminated second-growth hickory, forming an effective shock-absorbing unit adding little to the total resistance of the machine.

A striking color scheme has been selected to give the machine a unique appearance; the body, struts, stabilizer and fin are finished in dull black. The natural finish of the brass wing radiators is carried out with the same color finish on the Curtiss-ply wing ends and on the elevators. The rudder is striped with the customary red, white and blue, and the star insignia appears underneath the lower wing panels, near the tips.

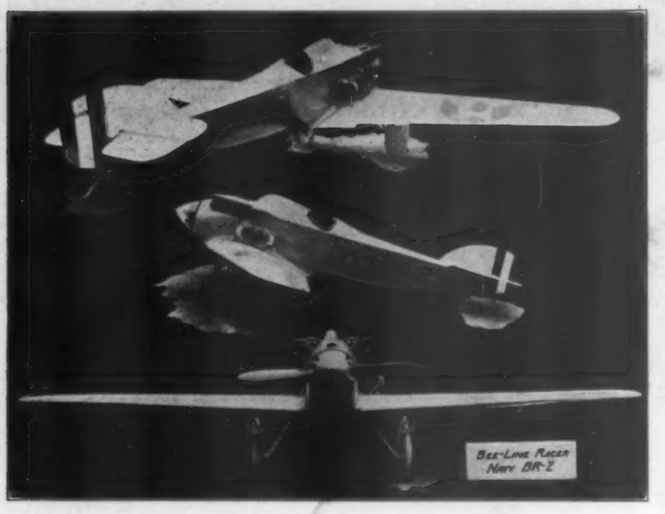
CHARACTERISTICS

Dimensions
Span, 19 ft. 0 in.
Length, 18 ft. 11 in.
Height, 7 ft. 10 in.
Chord (all wing), 46 in.
Angle of incidence, 0 deg.
Gap, 46½ in.
Stagger, 7½ in.
Dihedral, 0 deg.
Tread of wheels, 58½ in.
Areas
Upper wing panel with ailerons, 68.4 sq ft.
Lower wing panels with ailerons, 62.74 sq. ft.
Total supporting wing area incl. stubs and landing gear fairing, 138.0 sq. ft.

Ailerons, 9.25 sq. ft.
Horizontal stabilizer, 11.2 sq. ft.
Elevator, 6.9 sq. ft.
Fin, 4.9 sq. ft.
Rudder, 4.9 sq. ft.
Wing section, Curtiss 27.
Performance
High speed, 200 m.p.h.
Low speed, 70 m.p.h.
Weights
Light, 1454 lb.
Useful load, 496 lb.
Gross, 1950 lb.

The Navy-Curtiss Triplane

This triplane designed and built by the Curtiss Aeroplane and Motor Corp., was brought out in 1920 as an American entry for the Gordon Bennett race held in France. It was designed by W. L. Gilmore, with the aid and supervision of Glenn H. Curtiss, as a monoplane with a landing speed of around 100 m.p.h. Under trials carried on, on the fields on Long Island, this landing speed was found to be entirely practicable, but on arrival in France, due to the condition of the fields and to the shifting of the starting point from one field to another, it was necessary to add a second wing in order to reduce the landing speed. This was obtained and a new figure of low flight of 85 m.p.h. realized. On its return to the United States, it was prepared for entry in the Pulitzer



The Navy BR-2 (Bee-Line) racer (380 hp Wright) entered in the Pulitzer race. Pilot: Lt. S. W. Callaway, U.S.N., or Lt. D. Rittenhouse

Race in Omaha in 1921. Again due to extraordinarily poor field conditions, a third wing was added, thus reducing the landing speed as a triplane to 70 m.p.h.

As a monoplane this machine established in straight flight a speed of around 200 m.p.h., and as a triplane, a speed of 193 m.p.h. This was on Roosevelt Field on Long Island in the Fall of 1921.

The Navy-Curtiss Triplane will appear in Detroit as practically a new machine. It will be powered with a 430 hp. C12 geared engine, constructed by the Curtiss Aeroplane and Motor Corp. By gearing the motor the propeller turns at three-fifths of the engine's speed.

The Triplane has a multiple spar wing, which is described more fully under the Army entry. Its fuselage is of monocoque, and is constructed of Curtiss plywood. A characteristic of the Triplane is its radiation. It is equipped with a flat-plate Curtiss radiator attached to the fuselage.

The color of the Triplane will be as follows: red fuselage; silver wings, struts black.

CHARACTERISTICS

Type, tractor triplane.
Span upper wing, 20 ft.
Span lower wing, 20 ft.
Span int. wing, 20 ft.
Total length, 19 ft. 3 in.
Cord upper wing, 42 in.
Cord int. wing, 36 in.
Cord lower wing, 36 in.
Gap, upper, 32 in.
Gap, lower, 31 in.
Height, overall, 8 ft. 6 in.
Wing area, 179.5 sq. ft.
Dihedral, 2¾ o. lower
Stagger, 12 in.
Incidence, 0
Weight empty, 1936 lb.
Gross weight, 2406 lb.
Maximum speed, 196 m.p.h. at sea level
Landing speed, 70 m.p.h. at sea level
Climbing speed, 14,500 ft. in 10 min.
Ceiling, 25,000 ft.
Gliding angle, 1 in 9
2250 r.p.m.

The Bee-Line (Booth) Racers

The Bee-Line racers of the Navy were designed and built by Messrs. Booth and Thurston of the Aerial Engineering Corp., Hammondsport, N. Y., who a year ago were employees of the Curtiss Aeroplane and Motor Corp. and worked on the design of the Navy Curtiss 1921 Racer. Therefore, it may be concluded that the BR will incorporate a good deal of the experience of the CR type.

The BR represents an attempt to take another step in the matter of aerodynamic refinement suppressing completely the structural bracing required by wings of a biplane by the use of an unbraced monoplane wing. In addition, there is a retracting land gear by which the entire landing gear is retracted into the body of the fuselage once the plane is in the air so that in flight only the fuselage and wings present resistance to the air.

A further innovation of a frankly experimental character has been tried on one of the BR planes and this is the complete suppression of the radiator which all water-cooled engines have to have carried for them. This is done by covering the entire wing with a thin sheet of copper under which the water circulates so that the wing itself becomes one large radiator performing the double fuction of cooling the engine and supporting the weight of the plane.

In general the BR airplanes represent in their design and construction not only the last word in refinement, but three radical innovations in design which, if successful, will have a profound influence on the future design of high performance military and naval airplanes. The BR planes are fitted with the Wright H3 special high compression engine developing 400 hp.

CHARACTERISTICS

Type, tractor monoplane.
Span, 28 ft. 1 in.
Length, 21 ft. 1¼ in.
Height, 6 ft. 4½ in.
Chord, 2 ft. at tips to 6 ft. at fuselage.
Gap, 0
Angle of incidence,
Dihedral, 3½ deg.
Wing area, 104 sq. ft.
Aerofoil section, Gottingen 387
Gross weight, 2020 lb.
Maximum speed, 190 m.p.h.
Stalling speed, 70 m.p.h.
Engine, Wright H3, 400 hp.
Pilot: Lt. David Rittenhouse, U.S.N.

The Loening Racers

The two Loening Racers entered in the Pulitzer Trophy race by the Army Air Service possess many outstanding features. Contrary to the usual practice heretofore where the fuselage of the airplane is customarily considered the chassis upon which the motor is mounted, in these new Loening monoplanes, the heavy continuous wing spars of the main wing structure are the chassis members also, and the engine is mounted directly on them in a rugged and simple manner. The entire structure of these machines has been reduced to a simplicity in installation and details that has caused very favorable comment among airplane experts who have examined them.

The engine used on these planes is the new 600 hp., 12 cyl. Packard specially developed for the Army Air Service by the Packard Motor Car Co. of Detroit. This engine is installed at the nose of the machine and is relatively so large in comparison to the small airplane that the engine itself extends over a third the distance of the fuselage back to the rear spar of the wings. It is the comparatively large size of the engine and the appearance of the airplane that has led to the comment frequently made about this machine that it is the simplest flying engine ever built and is exactly the opposite extreme in tremendous power applied to an airplane from the gliders with no power that have been recently flown in Germany.

The outstanding feature of this machine is that it is the most highly powered airplane for its size ever built. The total

weight of the machine with gasoline, oil, and including the weight of the pilot, ready for flight, is 2700 lb. and since the engine is capable of developing 630 hp., the whole airplane, engine, load and all go into the air at the extremely low power loading of 4.3 lb. per horsepower, a figure which has never up to now been attained either in this country or Europe. The best power loading to be compared to this is that of the Nieuport racing machine in France upon which Sadi Lecointe made his records last year, which was 6 lb. per horsepower. It has, therefore, been estimated that this airplane should be well over the 190 m.p.h. mark and since the wing loading is only 16 lb. to the square foot, whereas many racing airplanes have gone up to 18 lb. to the square foot, the pilots anticipate considerable maneuverability in the machine in making the sharp turns of the course.

The relative weights of the airplane are also very interesting. The whole airplane (wings, landing gear, fuselage and tail) weighs 500 lb., which is one-third the weight of the power plant, including engine, radiator, water, etc. It may readily be understood that this is an unusual result when it is considered that on most airplanes the weight of the airplane portion is usually equal to and sometimes as much as twice as great as the weight of the power unit.

The gas tank is back of the engine and carries 1½ hr. fuel, sufficient for a flight of 300 miles. The pilot sits well to the rear of the whole plane, with extremely good visibility, particularly for landing, and entirely protected from the wind, which on such fast machines becomes a very serious matter.

The construction of the machine was kept secret up to Sept. 18, when the Loening Aeronautical Engineering Corp. held an exhibition of the machine prior to its shipment to Detroit, for airplane experts in this vicinity.

CHARACTERISTICS

Type, tractor monoplane.
Span, 27 ft.
Overall length, 21 ft.
Height, 7 ft.
Wing area, 174 sq. ft.
Gross weight, 2,700 lb.
Maximum speed, 190 m.p.h.
Landing speed, 72 m.p.h.
Engine, Packard "2025", 600 hp.
Pilots: Lt. E. C. Whitehead and Lt. Lac.D. Schulze.

The Thomas-Morse Racers

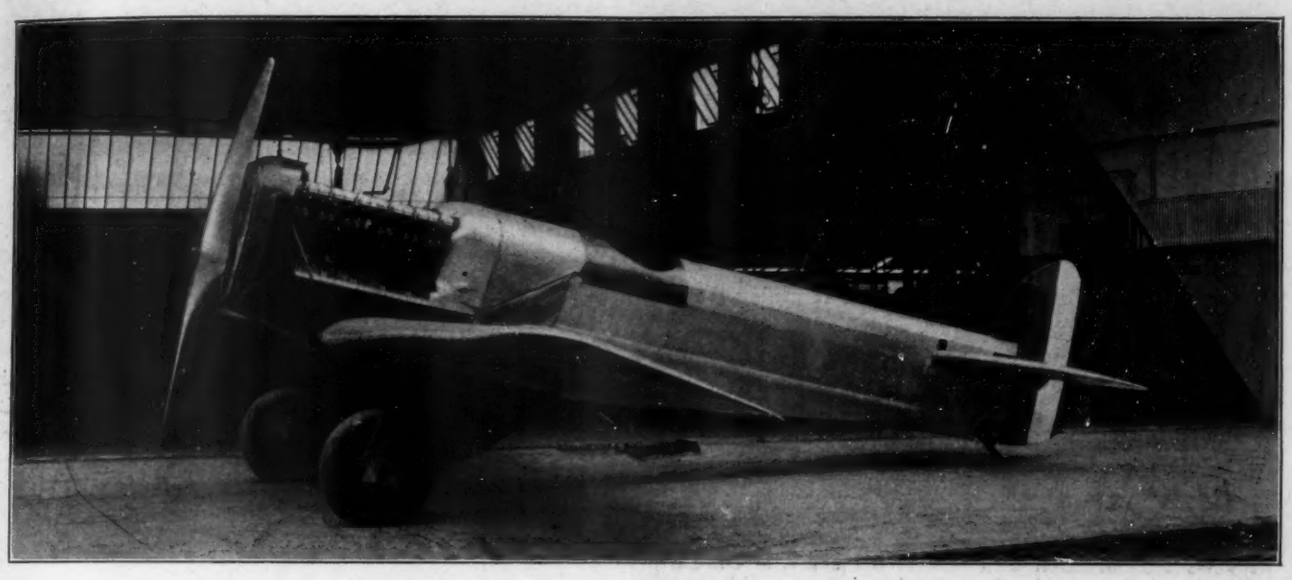
Not counting the Thomas-Morse MB3 ships, which are standard pursuit machines, three airplanes specially built for this event by the Ithaca firm will participate in the Pulitzer Trophy race. Two of these ships, designated as Model TM22, are entered by the Army, while the third, Model MB7, is entered by the Navy.

These two types have a notable family resemblance in that both are raised wing semi-cantilever monoplanes, the TM22 representing a further development of the MB7 which was produced for last year's Pulitzer race. The TM22 racers are noteworthy for the fact that they are entirely of metal construction, the wings and fuselage being covered with corrugated sheet duralumin. Duralumin is also used in the construction of the fuselage, wing and tail plane structures, while the engine mounting is of steel tubing.

CHARACTERISTICS OF THE TM22 RACER

Span, 20 ft.
Overall length, 19 ft. 9 in.
Chord of wing, 6 ft.
Wing area, 172 sq. ft.
Gross weight, 2,750 lb.
Engine, Packard "2025", 600 hp.
Pilots: Capt. F. O. D. Hunter and Lt. C. L. Bissell.

The Thomas-Morse MB7 racer is of more orthodox construction, with fabric covered wings and fuselage, the structure of which is of wood.



One of the two Loening Racers (600 hp. Packard) entered by the Army Air Service in the Pulitzer Trophy race. Pilots: Lt. E. C. Whitehead and Lt. L. D. Schulze

CHARACTERISTICS OF THE MB7 RACER

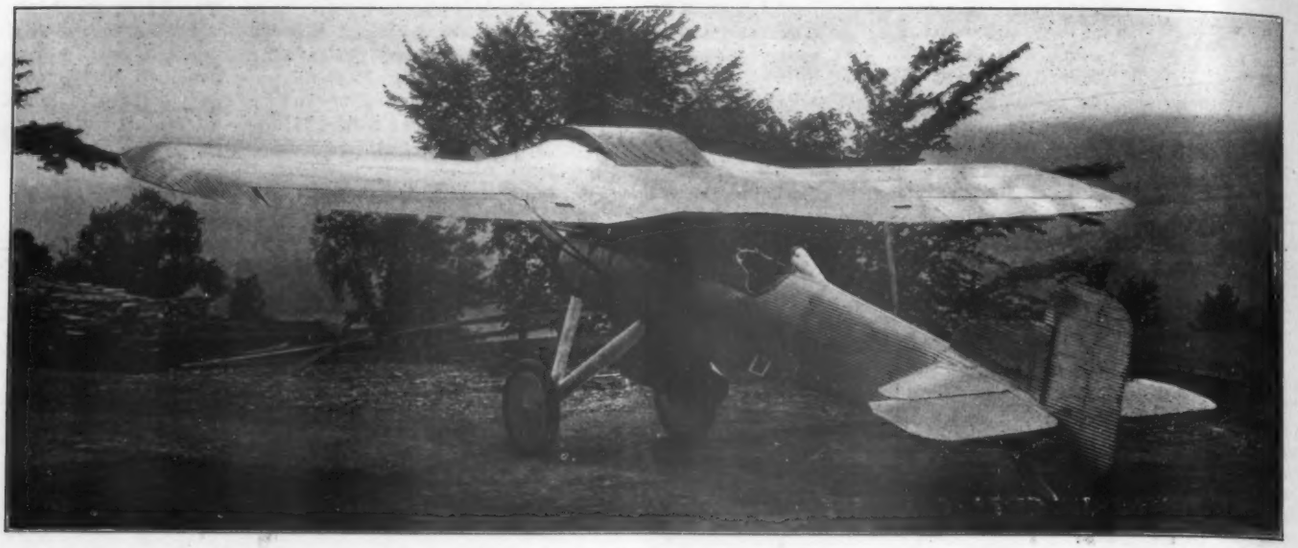
Type, tractor monoplane.
Span, 24 ft. 0 in.
Length, 18 ft. 6 in.
Height, 7 ft. 3 in.
Chord mean, 5 ft 0 in.
Angle of incidence, 1 deg.
Dihedral, 5 deg.
Wing area, 112 sq. ft.
Aerofoil section, Mod. USA27
Gross weight, 2000 lb.
Maximum speed, 180 m.p.h.
Stalling speed, 60.5 m.p.h.
Engine, Wright H3, 400 hp.
Pilot: Capt. F. P. Mulcahy, U.S.M.C.

The Verville-Sperry Racers

Two Verville-Sperry Racers have been entered in the Pulitzer race by the Army Air Service. These ships were built to the designs of Alfred V. Verville, of McCook Field, by the Sperry Aircraft Co., at Farmingdale, L. I. They are underslung internally braced monoplanes and are equipped with a special high compression type H3, 380 hp. engine built by the Wright Aeronautical Corp. of Paterson, N. J.

Features of construction are:

(1) Retractable wide track landing gear.
(2) The wheels are so built that they extend out under the wings and fold up under the wings when the machine is in flight.
(3) What is believed to be an absolutely unique feature is a shock absorbing wheel. The axle is embedded in rubber, and much of the shock of landing is thus eliminated.
(4) The fuselage and tail surfaces are completely constructed of steel tubing. This development has been so perfected in the Sperry shops that production upon a large scale is now possible.
(5) The Verville-Sperry plane has an adjustable stabilizer. This means that it will be possible to adjust the angle



One of the two Thomas-Morse TM22 racers (600 hp. Packard), entered by the Army Air Service in the Pulitzer Trophy race. Pilots: Capt. F. O. D. Hunter and Lt. C. L. Bissell

of incidence on the field, instead of returning the ship to the factory.

Another feature is the shock absorbing engine mounting. The engine bolts are embedded in rubber spools. As is the case in practically all engines there is considerable vibration when run under full throttle. Much of this vibration is eliminated by this shock absorbing mounting.

The plane is equipped with the Lamblin type of water and oil radiators; both hung under the fuselage.

The forward half of the fuselage is covered with aluminum cowling. The aft half is covered with linen. The wings are of wooden construction with wooden box spars, and are covered with cloth. The leading edge is reinforced with veneer. The plane is equipped with long, narrow ailerons, each having an area of 6 sq. ft. The area of the elevator is 9½ sq. ft.; of the stabilizers, 13½ sq. ft.; of the rudder 6 ft. and of the fin, 5 ft.

The wing section is double cambered. This cuts down the drag and thereby increases the overall efficiency of the craft. Specifically it limits the range of center of pressure travel.

The characteristic general color of the planes is khaki, with the usual Air Service stripe and insignia, but Mr. Verville is working out a striking color scheme which will make these monoplanes, which are naturally of impressive appearance, a most remarkable picture when in flight.

CHARACTERISTICS

Type, tractor monoplane.
Span, 32 ft. 4 in.
Overall length, 22 ft.
Chord, 5 ft.
Wing area, 150 sq. ft.
Gross weight, 2225 lb.
Engine, Wright H3 racing model, 380 hp.
Maximum speed, 190 m.p.h. (est.)
Landing speed, 67 m.p.h.

The Curtiss Engines

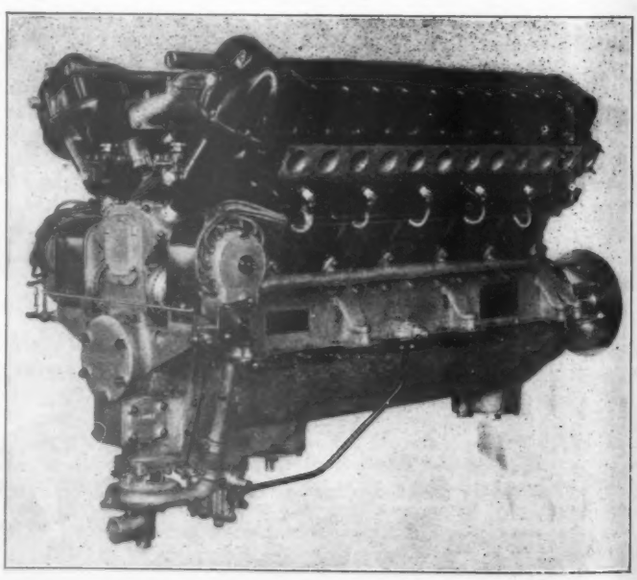
In the Triplane the Curtiss C12 engine will be used. This develops 430 hp. at 2250 r.p.m. The C12 engine has gears reducing the speed of the propeller and thus adding to the general speed of the plane.

The Navy Curtiss Racer is equipped with the Curtiss CD12 engine. It is direct drive and has many refinements over the C12 however, developing 400 hp. at 2000 r.p.m. Among the refinements is the method of holding the cylinder blocks on the crank case, and the general accessibility of the entire mechanism.

The Army racers are equipped with the Curtiss D12. This engine has the same bore and the same stroke as the C12 and the CD12, but is a further refinement over the preceding two. It has a greater bearing area. The whole gear case has been redesigned. The entire lower half of the engine has also been redesigned in order to make a conventional dry sump. (This is sometimes erroneously called an oil pan.) The Curtiss D12 develops 430 hp. at 2250 r.p.m. In weight it is 40 lb. lighter than the CD12. Two pounds per horsepower is considered light in an aeronautical engine, and yet the Curtiss D12 which powers the Army racers weighs but 1.56 lb. per hp.

CHARACTERISTICS OF THE CURTISS D12 ENGINE

Rated horsepower at 2000 r.p.m., 375
Rated horsepower at 2200 r.p.m., 430
B.hp. at sea level at 2000 r.p.m., 415
Type of engine, water cooled, direct drive.
Number of cylinders, 12
Bore and stroke, 4.5 in. x 6 in.
Angle of cylinders, 60 deg.
Weight complete with hub, and water, 715 lb.
Weight, empty, without accessories, 671 lb.



The new Curtiss Model D12, 375 hp. direct-drive aeronautical engine with which the Army-Curtiss racers are equipped

H. E. Honeywell on the Gordon Bennett Balloon Race

Editor, AVIATION:—

A word to your readers and lighter-than-air fans of the world relative to our part in the great Gordon Bennett balloon race from Geneva, Switzerland, Aug. 6, 1922. The entertainment committees were on the job every minute. Captain Tronchin deserves worthy mention and many others in that capacity—also for the able manner the entire affair was conducted. We found the grounds and gas facilities were well arranged, which together with an unusually fine day made our start very agreeable and perfect, before a huge appreciating audience.

The "Belgica" with Lieut. de Muyter at the wheel led off at 4.30 p. m. We were twelfth to take the air in a field of nineteen competitors representing seven countries. We ascended slowly and gracefully amid great cheering, to about one thousand feet where we caught a favorable current N.N.E. carrying us out over Lake Geneva and desired direction. Our aim at the start was for endurance, believing time would win distance which is all that counts in this contest, air line. Passing off the Lake at Lucerne and on to Berne 10.15 p. m. Almost immediately after a squall (rain storm) overtook us, causing the loss of considerable ballast; then followed a close succession of electric, thunder and heavy rain storms which further depleted our ballast. Right then I decided to pay the price in both sand and gas, ascend into the broken cloud banks—storms themselves—to speed up, and make the best of it. We soon crossed St. Gallion and the South shore of Lake Constance into Germany, shortly after daylight we sighted Munich to the North, passing directly over Oberammergau (where we, my family and I, attended the Passion Play some weeks before). Our course had changed, due to the altitude, to E.S.E., carrying us toward Hockschwab Mountain, the highest peak in the neighborhood. We were compelled to throw ballast to clear it. A most beautiful sight—for the sun peeped over the Eastern horizon about this time, illuminating its great snow cap with its deep dark chasms on all sides, a guarding Angel over Hades. The Eastern end of the Alpian range soon melted away and we passed from Austrian mountainous country into beautiful table lands and Hungary. Stretching as far as the eye could reach to the right and to the left, great fields of cultivation. But right here a word of explanation is due poor hospitable Hungary, for they have not seen a drop of rain since April, with the result that most of their crops are burned up. Famine stares them in the face this winter. On the contrary, while in Germany from Cologne through to their Southeastern border (by train) good crops everywhere, people happy and well dressed, have not suffered the ravages of war as I saw later in France. Soon after passing the Hungarian frontier, we observed the beautiful blue river Danube to our left, stretching out and diminishing as a thread in the east. About 3 p. m. we passed directly over the South suburbs of their great capital city, Budapest, with the river Danube running Southerly and just beneath us.

We had been suffering many hours for want of oxygen as our supply was inadequate for the continuous high altitude we were compelled to maintain for two very good reasons. First: to hold the only favorable air current running in our direction; second: to allow the balloon "Uncle Sam" to drop to a lower level meant considerable ballast of which we were painfully short. However, the warm sun soon settled behind a heavy cloud bank in the West, causing the gas to contract rapidly, and suddenly an earthward movement from 12,000 ft. (or over two miles high) took place. Using our little ballast (sand) as a break, similar to an automobile going down a steep long mountain grade, this same brake—broke, as it were, about half way down (or 6000 ft.). Right there we resorted to our remaining provisions and extra clothing. At 7.30 p. m. (or 27 hr. out.) our basket landed with a bump in a nice plowed field and very fortunately near a small hamlet and railroad. The little village proved to be Tapiogyörgye, Hungary, 75 kilometers E.S.E. of Budapest. J. H. Wade, my most worthy aide and myself were royally entertained by Adam Fluck, the manager of some Count's estate, who proved to be a prince of a fellow. Upon arriving at Budapest some three days later we learned by wire that we probably had won the great race, due to the fact that the balloon "Belgica," though covering the greater distance, got away from her pilot in making his landing and might be disqualified. I have very little hope of being awarded the cup for the fact that it would be the fifth time America has won that coveted trophy and according to the rules, any country winning it five times in any number of years, finishes the Gordon Bennett contests for all time.

Again, had the French balloon been second deMuyter would have been disqualified immediately, if for no other reason but for not mailing in his log and landing certificate within the required 48 hours after landing. J. Berry was disqualified for the same reason in the 1912 Stuttgart Race.

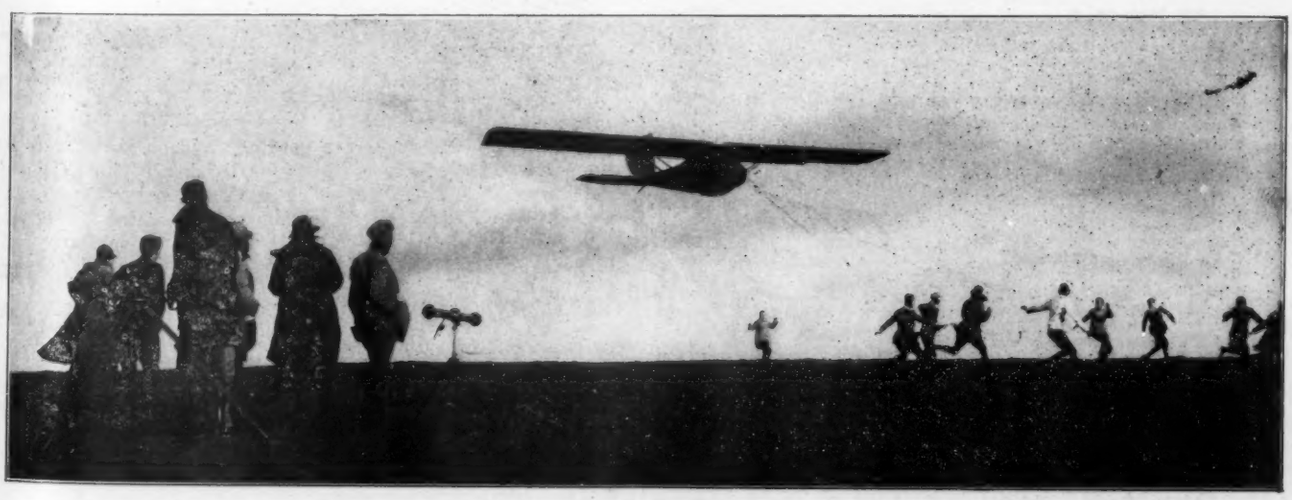
It was also stated in Paris that should de Muyter be disqualified the cup would go to France.

If these races are not going to be conducted fairly, I am done.

H. E. HONEYWELL

St. Louis, Mo.

How a Sailplane is Launched



Remarkable picture of the Darmstadt-4 sailplane "Edith," piloted by Botsch, just after taking off. (Span 41 ft. 6 in.; length 18 ft. 2 in.; height 5 ft.; wing area 161 sq .ft; net weight 200 lb.)

ARMY AND NAVY AIR NEWS

Air Service

New Distribution of Air Service Troops—General Army Order of July 19, 1922, provides for the following redistribution of the Air Service Troops:—

Aberdeen
Airship Company No. 18 (Reduced Strength) 100
49th Squadron (Bombardment) (Detached from 2nd Group (Bombardment) at Langley) 132
Bolling
99th Squadron (Observation) (R. S.) 90
Photo Section No. 3 20
Air Park No. 1 (R. S.) 142
Headquarters Detachment 30
Brooks
Primary Flying School, organized as 11th Group (School), consisting of
Headquarters, 11th Group (School) 35
46th Squadron (School) 132
47th Squadron (School) 132
Air Park No. 7 172
Photo Section No. 24 20
Chanute
Technical School 201
15th Squadron (Observation) (R. S.) 90
Photo Section No. 5 20
Crissy
91st Squadron (Observation) 132
Photo Section No. 15 20
Air Intelligence Office No. 3 5
Ft. Bliss
12th Squadron (Observation) (R. S.) 90
Photo Section No. 1 20
Air Intelligence Office No. 2 5
Kelly
1st Wing (Provisional), consisting of Headquarters, 1st Wing 20
Advanced Flying School, organized as 10th Group (School), consisting of
Headquarters, 10th Group (School) 35
40th Squadron (School) 132
41st Squadron (School) 132
42nd Squadron (School) 132
43rd Squadron (School) 132
Air Park No. 13 172
Photo Section No. 22 20
3rd Group (Attack) (less Photo Section), consisting of
Headquarters, 3rd Group (Attack) 35
8th Squadron (Attack) 132
13th Squadron (Attack) 132
26th Squadron (Attack) 132
90th Squadron (Attack) 132
Air Park No. 5 172
Langley
2nd Wing (Provisional), consisting of
Headquarters, 2nd Wing 20
2nd Group (Bombardment), consisting of
Headquarters, 2nd Group (Bombardment) 35
11th Squadron (Bombardment) 132
20th Squadron (Bombardment) 132
49th Squadron (Bombardment (at Aberdeen) ..... —
96th Squadron (Bombardment) 132
Air Park No. 4 172
Photo Section No. 2 20
50th Squadron (Observation) (R. S.) 90
Photo Section No. 20 20
Air Park No. 3 172
Airship Company No. 19 130
Tactical School 96
Mitchel
9th Group (Observation), consisting of
Headquarters, 9th Group (Observation) 35
1st Squadron (Observation) (R. S.) 90
5th Squadron (Observation) (R. S.) 90
Photo Section No. 8 20
Photo Section No. 14 20
Air Park No. 6 172
Air Intelligence Office No. 1 5
Montgomery
22nd Squadron (Observation) 132
Photo Section No. 4 20
Post
44th Squadron (Observation) (R. S.) 90
Photo Section No. 23 20
Riley
16th Squadron (Observation) (R. S.) 90
Photo Section No. 9 20
Scott
Balloon and Airship School, organized as 1st Airship Group (less 1 company) consisting of
Headquarters, 1st Airship Group 18
Airship Company No. 8 130
Airship Company No. 9 130
Airship Company No. 12 130
Service Company (Airship) No. 24 100
Photo Section No. 21 20
Selfridge
1st Group (Pursuit), consisting of
Headquarters, 1st Group (Pursuit) 35
17th Squadron (Pursuit) 132
27th Squadron (Pursuit) 132
94th Squadron (Pursuit) 132
95th Squadron (Pursuit) 132
Air Park No. 2 172
Wilbur Wright
88th Squadron (Observation) (R. S.) 90
Photo Section No. 7 20
Oahu
5th Group (Composite), consisting of
Headquarters, 5th Group (Composite) 35
4th Squadron (Observation) 132
6th Squadron (Pursuit) 132
23rd Squadron (Bombardment) 132
Photo Section No. 11 20
Air Park No. 10 172
Air Intelligence Office No. 11 5
Panama
6th Group (Composite), consisting of
Headquarters, 6th Group (Composite) 35
7th Squadron (Observation) 132
24th Squadron (Pursuit) 132
25th Squadron (Bombardment) 132
Photo Section No. 12 20
Air Park No. 8 172
Air Intelligence Office No. 10 5
Philippine Islands
4th Group (Composite), consisting of
Headquarters, 4th Group (Composite) 35
2nd Squadron (Observation) 132
3rd Squadron (Pursuit) 132
28th Squadron (Bombardment) 132
Photo Section No. 6 20
Air Park No. 11 172
Air Intelligence Office No. 12 5
Flying Cadets 190

TOTAL 8500

RECAPITULATION OF 8500 AIR SERVICE DISTRIBUTION

	Number	Enlisted
Squadrons (Attack)	4	528
Squadrons (Bombardment)	7	924
Squadrons (Observation)	5	660
Squadrons (Observation) (Reduced Strength)	9	810
Squadrons (Pursuit)	7	924
Squadrons (School)	6	792
Photo Sections	18	360
Air Parks	10	1720
Air Parks (Reduced Strength)	1	142
Air Intelligence Offices	6	30
Wing Headquarters	2	40
Group Headquarters, H/A	9	315
Airship Companies	4	520
Airship Company (Reduced Strength)	1	100
Service Company (Airship)	1	100
Group Headquarters (Airship)	1	18
Headquarters Detachment	1	30
Technical School	1	201
Tactical School	1	96
Flying Cadets	—	190
TOTAL		8500

* * *

Presents Landing Field to Government—Work has been started upon hangars, and a contractor is on the ground to commence the grading of the 99th Division Flying Field at Pittsburgh, Pa. This field, which was presented to the government by the Aero Club of Pittsburgh, is located about one mile from Hoboken, Pa.—a short distance above Pittsburgh on the Allegheny River. It will be in shape to receive flying equipment in about a month.

Besides being the headquarters of the 324th Aero Squadron of the 99th Reserve Division, this field will serve for the Army Corps Squadrons of the surrounding counties.

At the Camp of Instruction recently held at Langley Field, Va., the 324th Aero Squadron was represented by two officers. Other squadrons of Western Pennsylvania represented were the 304th Squadron (Pursuit) and the 305th Squadron (Attack).

At an early date landmarks and directions for locating the 99th Division Field will be published.

Air Service Adopts Loening Air Yacht—The fast monoplane air yacht which Grover Loening, the airplane designer, developed for the use of Vincent Astor, Harold S. Vanderbilt, and others this summer for commuting from New York, has been adopted by the Army Air Service. Maj. General Mason L. Patrick, Chief of Air Service, prior to the placing of this order, conducted an exhaustive investigation of all known types of hydro-aircraft suitable for the Army's purpose.

At the Air Service stations and flying fields, not only in the Philippines, Hawaii and Panama, but also at Selfridge Field, Mt. Clemens, Mich., and Langley Field, Va., where the flying fields are situated alongside the water front, the Army proposes to use this type of craft for the speedy transportation of staff officers, for air mail and dispatches, and for general communication purposes in economically speeding up the work of the Air Service organizations. Inspection and travel from station to station by officers of the Air Service will be done much quicker and in a much more practical manner than is possible with the present types of planes, and the government will have in these air yachts, a vehicle for which great usefulness is foreseen, principally as a utility.

A preliminary order from the government for six air yachts has been received by the Loening Aeronautical Engineering Corp. These machines will be standard in every way, will have accommodation for five, and will use the high compression 400 hp. Liberty motor. Although the machines ordered are duplicates of the air yacht used by Mr. Astor this summer, there will be several minor improvements.

* * *

The Forest Fire Patrol in Oregon—The personnel of Crissy Field is once again spread over the Northwest in connection with the forestry patrol. Capt. Lowell H. Smith, Air Service, is in command of the detachment of the 91st Squadron (Obs.) engaged on this work, which is stationed at the Municipal Flying Field at Eugene, Ore. Other officers on duty there are Capt. Eugene G. Reinartz, Medical Corps, Flight Surgeon; Lieuts. Warren A. Maxwell, William C. Goldsborough, John R. Morgan and Russell L. Maughan.

Conditions for flying in the fire-swept area of Oregon are anything but desirable, and at times it is considerably difficult, due to the rugged country over which the flying is done and the lack of visibility caused by the smoke from the numerous fires. The Air Service has surely made itself solid with the people of Eugene and vicinity, and they are leaving no stone unturned to make the airmen's duty there one of pleasure and comfort. There has been a most urgent need for the patrol from the early season but, due to the lack of funds, it could not be given. The Oregonians, not satisfied with that condition, directed their endeavors in the right direction and, as a result, they succeeded in securing the patrol and thereby have saved many dollars and their timber land as well. During the first day of the air patrol thirteen fires were located in one county, and similar results followed subsequent air patrols, with the result that now the fire hazard has been reduced to a minimum.

Naval Aviation

Lieut. Frank C. Fechteler Killed—Lieut. Frank C. Fechteler, U.S.N., was accidentally killed when a Spad of which he was pilot crashed at Detroit on Sept. 18.

The funeral services were held with full military honors on Sept. 21 at Arlington National Cemetery.

Lieutenant Fechteler was born in San Rafael, Calif., July 8, 1897, and entered the U. S. Naval Academy in 1914, graduating in 1917. During the World War, he was attached to the U.S.S. Paducah operating in European waters. He entered Naval Aviation in May, 1920, and following a course of instruction at Pensacola, Fla., was designated as Naval Aviator and transferred to Kelley Field, San Antonio, Tex., for advanced training in land planes.

Lieutenant Fechteler has been identified with the Aircraft Squadrons of the Atlantic Fleet since the completion of his training in 1921 and has recently been attached to the U.S.S. Langley, the newly commissioned aircraft carrier. He was the son of the late Rear-Admiral Augustus F. Fechteler and was widely known in Naval circles in this city. Lieutenant Fechteler was known among his many friends in the Navy and in Naval Aviation as one of the most brilliant pilots in the service.

Four Marine planes from the Marine Aviation Field at Quantico scattered flowers at the funeral. The planes consisted of a formation of Vought scout planes piloted by Maj. Roy C. Geiger, commanding officer of the aviation station at Quantico, Capt. L. M. Bourne, Lieut. H. C. Major and Lieut. J. W. Wallace.

* * *

Air Squadrons, Pacific Fleet—Fighting Plane Squadron No. 1 of the Pacific Fleet took off on Sept. 5, from San Diego, fifteen ships flying in formation and proceeded on the popular operation of Field Service or Camping Out. Camp was pitched on the shore of the Pacific at a suitable spot where the men enjoyed fishing, swimming and baseball, after a strenuous period of target practice. One large tent hangar was used to house each plane, while the men slept two in a tent; galley, radio, hospital office, repair and storage tents were also erected, but the machine shop, a motor truck travelled with the motor transport. The camp is planned as a permanent affair, and each squadron will be sent out for a rest period.

* * *

Naval Aviators off to Detroit—The first Marine and Naval aviation detachment for the Detroit air races left Quantico on Sept. 22 in a Martin bomber of the Marine aviation force, piloted by Capt. J. E. Davis of the Marine Corps. The party consisted of Captain Davis, U.S.M.C., Lieut. E. W. Spencer, Lieut. Richard Botta and Lieut. C. H. Congdon, U.S.N., besides several Marine and Navy aviation mechanics.

The detachment will examine the field assigned to Marine and Naval aviators and will make preparations for caring for and handling the Navy and Marine Corps entries which will compete in the Pulitzer Races.

* * *

Reserve Pilots Complete Training—The following Naval reserve pilots recently completed flight training duty on board the U.S.S. Wright, Atlantic Fleet Aircraft Tender: Lieut. T. Durfee, Lieut. jg., R. D. Thomas, Lieut. jg., R. N. Smith, Lieut. R. F. Lyon, Lieut. jg., E. F. Brown, Lieut. jg., B. Baine, Lieut. jg., H. Schiff, Ens. H. Harder, Ens. P. T. Stonemetz and Ens. W. A. Rogers.

* * *

Philadelphia to Lake George—Lieut. Rutledge Irvine, U.S.N., is reported to have flown the H16 from Philadelphia to Lake George on a non-stop flight as the first leg of his trip to Detroit, where he will fly in the Curtiss Marine Trophy Race.

Coming Aeronautical Events

AMERICAN

Oct. 7 — *Detroit Aerial Water Derby, Detroit. (Curtiss Marine Flying Trophy Competition.)*

Oct. 12 — *Detroit News Aerial Mail Trophy Race, for multi-engined large-capacity airplanes; Detroit.*
Aviation Country Club of Detroit Trophy Race, for light commercial airplanes; Detroit.

Oct. 13 — *Liberty Engine Builders' Trophy Race, for two-seater observation airplanes; Detroit.*

Oct. 14 — *Pulitzer Trophy Race, for high speed airplanes; Detroit.*

Oct. 12-14 — *Second National Aero Congress; Detroit.*

FOREIGN

Oct. 8 — *International Parachute Competition. Rome, Italy.*

Oct. 16-21 — *British Sailplane Competition. For Daily Mail Prize.*

(Naval Aviation Continued)

Naval Orders—Lt. Guy D. Townsend, det. Aircraft Sqds., Scouting Flt.; to Nav. Air Sta. Hampton Roads, Va.

Lt. Patrick J. Kane, det. Naval Academy, Annapolis, Md.; to command Nav. Air Sta. Cape May, N. J.

Ens. Darrough S. Gurney, det. Nav. Air Sta. Pensacola, Fla.; to U.S.S. Florida.

Ens Edmond P. Spaight, det. Nav. Air Sta. Pensacola, Fla.; to U.S.S. Delaware.

Lt. John D. Price, det. Office, General Inspector of Naval Aircraft, McCook Field, Ohio; to Naval Aircraft Factory, Philadelphia, Pa.

Foreign News

Italy—Italian airships are resuming their activities. The PV has been transferred to the airport of Pompeii and will be employed for passenger service. Some of the Army and Navy airships which had been deflated and stored, will be overhauled and put in service as soon as possible.

There exists a certain rivalry between two parties, one of whom would build a Nobile semirigid type of a small capacity (20,000 cu. m.) to embody the latest improvements of a semi-rigid, while the other party would build the giant T type of 120,000 cu. m. to the designs of Usuelli. The first group states that the jump from 34,000 cu. m. to 120,000 cu. m. is too large, and the cost of the airship would be enormous, while the 20,000 mc. capacity would permit the utilization of a quantity of material left over from the second T34 which was not built. Furthermore it is desired to make comparative tests with the rigid Bodensee to show that the Mobile expects a far superior performance.

It is probable that both plans will be considered.

* * *

Netherlands—One million kilometers (621,370 miles) of flying with passengers, freight and mail were completed by the Royal Netherlands Air Line Co. on July 22, 1922, says consul Mahin, Amsterdam, in advices to the Department of Commerce.

Not a single accident has occurred, the consul reports. This company has a daily service between Amsterdam and Paris and a twice a day service between Amsterdam and London. The distance over each of these routes is approximately 300 miles.

* * *

France—Messageries Aeriennes supplemented their transport service recently with an aerial route from London to Marseilles, machines leaving London at 8.00 a. m. and scheduled to arrive at Marseilles at 5.10 p. m., with stops at Paris and Lyons. The actual flying time is 7½ hr. The return journey is started at 9.00 a. m., London being reached at 6.30 p. m. Planes used on this service are Spads and Goliaths, both equipped with Hispano-Suiza engines.

* * *

Great Britain—The British government, it is reported, has granted permission for a Bradford-Leeds-London passenger and mail service, according to Consul W. J. Young, at Bradford, England.

It is planned to have stations also at Doncaster, Grantham and Peterborough, he states, the route to be covered by four Avro airplanes. Captain Taylor, who obtained the license, is now flying at Bradford.

* * *

Brazil—The London *Times* reports that the sum of £10,000 raised by popular subscription, has been presented to the Portuguese naval airmen, Commanders Coutinho and Cabral, in the form of a draft on London, for the purchase of airplanes as a gift to the Portuguese government in recognition of the Lisbon-Rio flight.

Where to Fly

CALIFORNIA
SAN FRANCISCO, CALIFORNIA
EARL P. COOPER AIRPLANE & MOTOR CO.

ILLINOIS
PARTRIDGE, Inc.
Aeronautical Instruction
Aero Club of Illinois Field. Chicago, Ill.
Mail Address-- 430 S. Michigan Ave.
Write for Booklet

INDIANA
One of the largest and best equipped flying fields in the United States.
KOKOMO AVIATION CORP.
Kokomo, Indiana
ALL TYPES OF CURTISS PLANES.

MARYLAND
Logan Field, 5 miles S. E. of Baltimore
All branches of Commercial Aviation,
Shops, Hangars and efficient Field Service.
AMERICAN AIRCRAFT Inc., Station F, Box 104, Baltimore, Md.

MICHIGAN
AEROMARINE AIRWAYS, INC.
Daily Service to Cleveland
MEMORIAL PARK & RIVER
DETROIT
11 Passenger Flying Cruisers

MINNESOTA
WHITE BEAR LAKE, MINN.
"The Twin Cities' chief summer resort.
Harold G. Peterson Aircraft Company
SCHOOL OF AVIATION

NEW JERSEY NEW YORK AIR TERMINAL
800 Acres -- 6 miles from Times Square.
Learn on ships that cannot tail spin. Planes rented $30. hr.
CHAMBERLIN AIRCRAFT
Hasbrouck Heights, N. J.

NEW YORK & NEW JERSEY
CURTISS FIELD, GARDEN CITY, LONG ISLAND
KENILWORTH FIELD, BUFFALO, N. Y.
FLYING STATION, ATLANTIC CITY, N. J.
CURTISS AEROPLANE & MOTOR CORPORATION

NEW YORK
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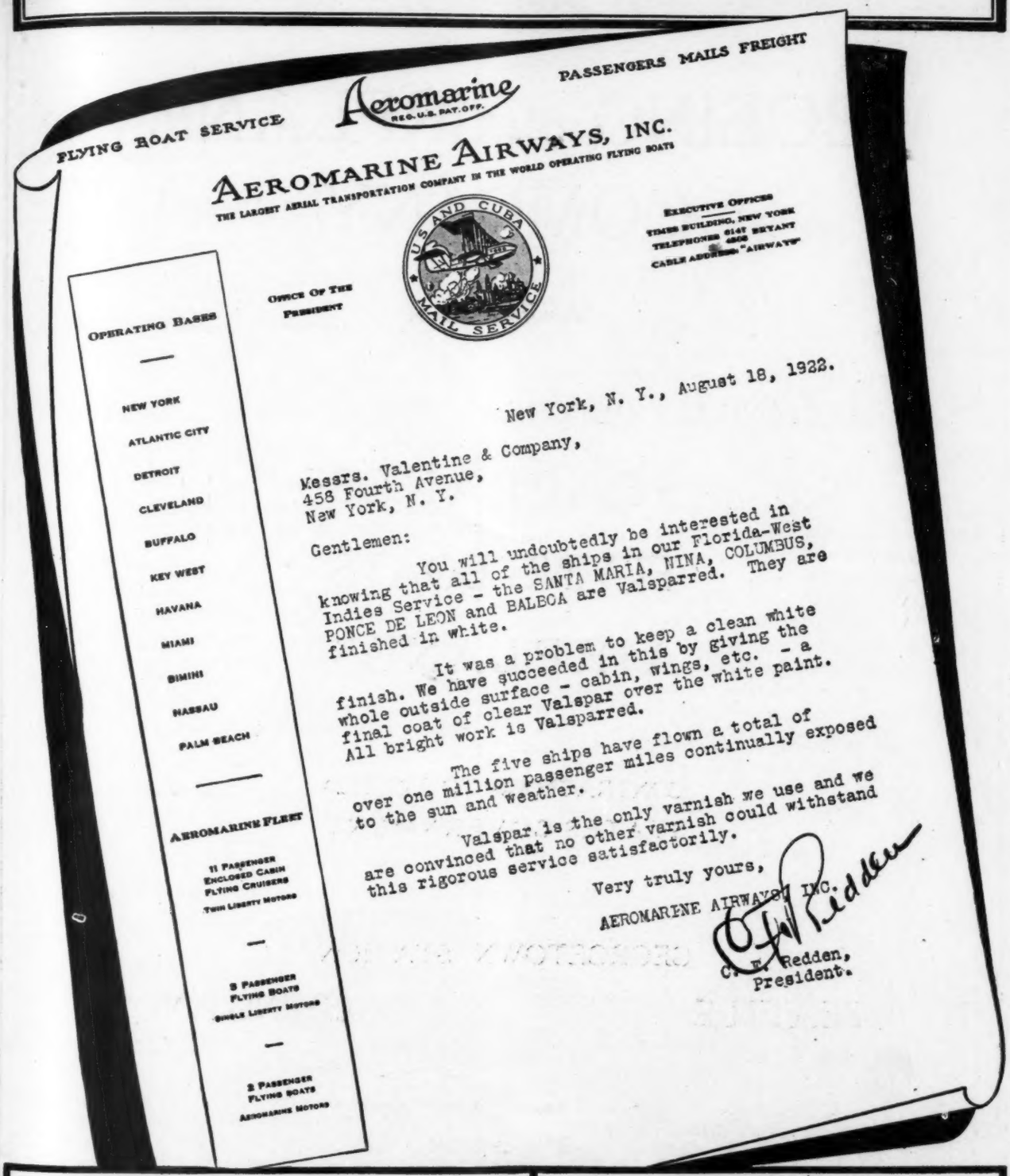

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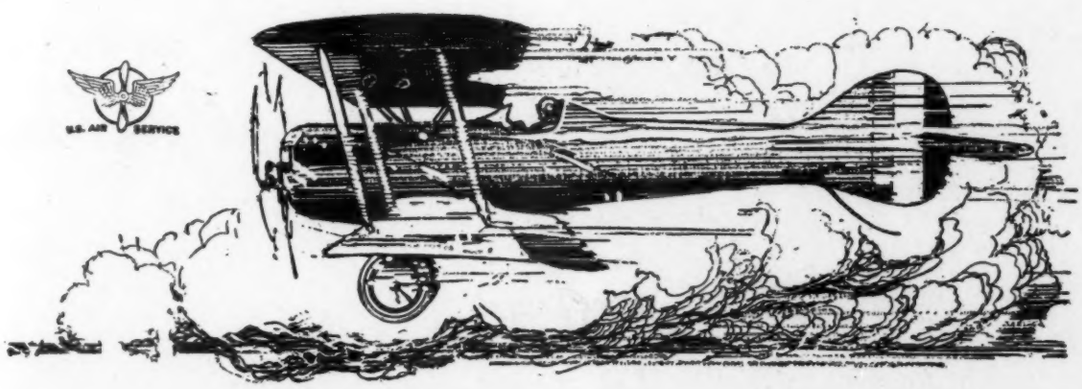

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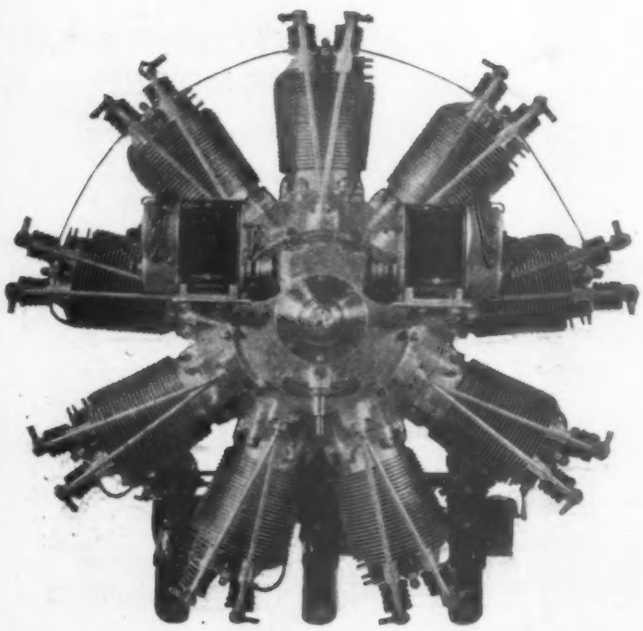

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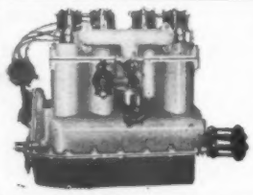
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